CLAIMS

1. A hyperspectral imager comprising:
a first optical sub-system;
at least one slit element;
said first optical sub-system being capable of imaging, onto said at least one slit element, electromagnetic radiation emanating from a source;
a second optical sub-system;
said second optical sub-system being capable of substantially collimating, at a center plane, electromagnetic radiation emanating from said at least one slit element;
at least one reflective dispersive element located substantially at the center plane;
said second optical sub-system also being capable of imaging, onto an image surface, the electromagnetic radiation reflected from said at least one reflective dispersive element; and,
at least one detecting element located substantially at the image surface;
said at least one detecting element being capable of detecting dispersed electromagnetic radiation reflected from said at least one reflective dispersive element.

2. The hyperspectral imager of claim 1 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;
said second optical axis being substantially parallel to said first optical axis.

3. The hyperspectral imager of claim 1 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;

said second optical axis being substantially coincident with said first optical axis.

4. The hyperspectral imager of claim 1 further comprising:

a first sub-housing;

at least one optical component from said first optical sub-system being positioned within said first sub-housing;

said first sub-housing defining a first interior longitudinal axis;

an optical axis of said at least one of optical component from said first optical sub-system being substantially coincident with said first interior longitudinal axis; and,

a second sub-housing;

said at least one slit element and at least one optical component from said second optical sub-system being positioned within said second sub-housing;

said second sub-housing defining a second interior longitudinal axis;

an optical axis of said at least one of optical components from said second optical sub-system being substantially coincident with said second interior longitudinal axis;

said second sub-housing being attached to said first sub-housing;

said second interior longitudinal axis being substantially coincident with said first interior longitudinal axis.

5. The hyperspectral imager of claim 4 further comprising:

a third sub-housing;

at least another optical component from said second optical sub-system and said at least one

reflective dispersive element being positioned within said third sub-housing;
said third sub-housing defining a third interior longitudinal axis;
an optical axis of said at least another optical component from said second optical sub-system being substantially coincident with said third interior longitudinal axis;
said second sub-housing being attached to said third sub-housing;
said second interior longitudinal axis being substantially coincident with said third interior longitudinal axis.

6. The hyperspectral imager of claim 4 wherein said second sub-housing is removably attached to said first sub-housing.

7. The hyperspectral imager of claim 5 wherein said third sub-housing is removably attached to said second sub-housing.

8. The hyperspectral imager of claim 4 wherein said at least one detecting element is positioned within said second sub-housing.

9. The hyperspectral imager of claim 1 further comprising:
a redirecting optical element optically disposed between said second optical sub-system and the image surface.

10. The hyperspectral imager of claim 9 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;
said second optical axis being substantially parallel to said first optical axis.

11. The hyperspectral imager of claim 9 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;
said second optical axis being substantially coincident with said first optical axis.

12. The hyperspectral imager of claim 9 further comprising:
a first sub-housing;
at least one optical component from said first optical sub-system being positioned within said first sub-housing;
said first sub-housing defining a first interior longitudinal axis;
an optical axis of said at least one of optical component from said first optical sub-system being substantially coincident with said first interior longitudinal axis;

a second sub-housing;
said at least one slit element, said redirecting optical element and at least one optical component from said second optical sub-system being positioned within said second sub-housing;
said second sub-housing defining a second interior longitudinal axis;
an optical axis of said at least one of optical components from said second optical sub-system being substantially coincident with said second interior longitudinal axis;
said second sub-housing being attached to said first sub-housing;
said second interior longitudinal axis being substantially coincident with said first interior longitudinal axis.

13. The hyperspectral imager of claim 12 further comprising:

a third sub-housing;

at least another optical component from said second optical sub-system and said at least one reflective dispersive element being positioned within said third sub-housing;

said third sub-housing defining a third interior longitudinal axis;

an optical axis of said at least another optical component from said second optical sub-system being substantially coincident with said third interior longitudinal axis;

said second sub-housing being attached to said third sub-housing;

said second interior longitudinal axis being substantially coincident with said third interior longitudinal axis.

14. The hyperspectral imager of claim 12 wherein said second sub-housing is removably attached to said first sub-housing.

15. The hyperspectral imager of claim 13 wherein said third sub-housing is removably attached to said second sub-housing.

16. The hyperspectral imager of claim 12 wherein said at least one detecting element is positioned within said second sub-housing.

17. The hyperspectral imager of claim 1 further comprising:

a redirecting/transmitting optical element optically disposed between said second optical sub-system and the image surface;

said second optical system also being capable of imaging, onto another image surface, a transmitted

portion of the electromagnetic radiation reflected from said at least one reflective dispersive element; and,
at least one other detecting element located substantially at the another image surface.

18. The hyperspectral imager of claim 17 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;
said second optical axis being substantially parallel to said first optical axis.

19. The hyperspectral imager of claim 17 wherein said first optical sub-system has a first optical axis; and,
said second optical sub-system has a second optical axis;
said second optical axis being substantially coincident with said first optical axis.

20. The hyperspectral imager of claim 17 further comprising:
a first sub-housing;
at least one optical component from said first optical sub-system being positioned within said first sub-housing;
said first sub-housing defining a first interior longitudinal axis;
an optical axis of said at least one of optical component from said first optical sub-system being substantially coincident with said first interior longitudinal axis;

a second sub-housing;
said at least one slit element, said redirecting/transmitting optical element and at least one optical component from said second optical sub-system being positioned within said second sub-housing;

said second sub-housing defining a second interior longitudinal axis;
an optical axis of said at least one of optical components from said second optical sub-system being substantially coincident with said second interior longitudinal axis;
said second sub-housing being attached to said first sub-housing;
said second interior longitudinal axis being substantially coincident with said first interior longitudinal axis.

21. The hyperspectral imager of claim 20 further comprising:
a third sub-housing;
at least another optical component from said second optical sub-system and said at least one reflective dispersive element being positioned within said third sub-housing;
said third sub-housing defining a third interior longitudinal axis;
an optical axis of said at least another optical component from said second optical sub-system being substantially coincident with said third interior longitudinal axis;
said second sub-housing being attached to said third sub-housing;
said second interior longitudinal axis being substantially coincident with said third interior longitudinal axis.

22. The hyperspectral imager of claim 20 wherein said second sub-housing is removably attached to said first sub-housing.

23. The hyperspectral imager of claim 21 wherein said third sub-housing is removably attached to said second sub-housing.

24. The hyperspectral imager of claim 20 wherein said at least one detecting element is positioned within said second sub-housing.

25. The hyperspectral imager of claim 1 wherein said first optical sub-system is a catadioptric sub-system.

26. A method for detecting wavelength dependent content of electromagnetic radiation, the method comprising the steps of:

imaging electromagnetic radiation emanating from a source of electromagnetic radiation onto at least one slit element;
substantially collimating the electromagnetic radiation emanating from the at least one slit element;
angularly separating the substantially collimated electromagnetic radiation according to its wavelength;
imaging the angularly separated electromagnetic radiation onto at least one detecting element;
orienting optical elements collimating the electromagnetic radiation and optical elements imaging the electromagnetic radiation emanating from the source such that an optical axis of the collimating optical elements is substantially parallel to an optical axis of the optical elements imaging the electromagnetic radiation emanating from the source; and,
detecting the angularly separated electromagnetic radiation.

27. A hyperspectral imager comprising:

at least one slit element;
means for imaging electromagnetic radiation from a source of electromagnetic radiation onto said at least one slit element;

means for substantially collimating the electromagnetic radiation emanating from said at least one slit element;

means for angularly separating the substantially collimated electromagnetic radiation according to its wavelength;

at least one detecting element; and,

means for imaging the angularly separated electromagnetic radiation onto at least one detecting element.